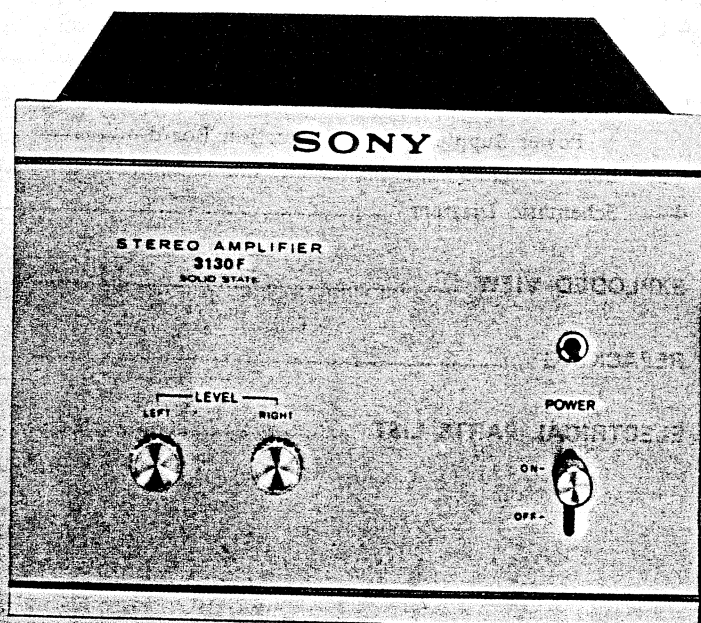
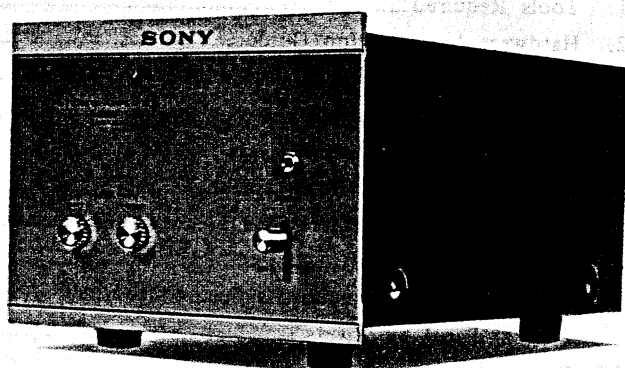




Set using ISO screws

TA-3130F

General Export Model



SONY®
SERVICE MANUAL

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SECTION 1

TECHNICAL DESCRIPTION

1-1. TECHNICAL SPECIFICATIONS

Technical specifications for the TA-3130F are given in Table 1.

TABLE 1. SPECIFICATIONS

Power Amplifier Section	
Dynamic power output:	220 watts (4 ohms), both channels operating
(IHF constant power supply method)	200 watts (8 ohms), both channels operating
Continuous RMS power:	75 watts (4 ohms), both channels operating 70 watts (8 ohms), both channels operating
20 Hz to 20 kHz power:	50 watts (8 ohms), both channels operating
Power bandwidth:	7 Hz to 30 kHz, IHF
Harmonic distortion:	Less than 0.1% at rated output Less than 0.05% at 1 watt output
IM distortion: (60 Hz : 7 kHz = 4 : 1):	Less than 0.1% at rated output Less than 0.05% at 1 watt output
Frequency response:	10 Hz to 200 kHz ± 0.5 dB (at 1 watt output)
Signal to noise ratio:	110 dB, shorted input (weighting network "A")
Residual noise:	Less than 0.008 μ W
General	
Power consumption:	Approx. 260 watts
Power requirement:	100, 117, 220, 240 volts, 50/60 Hz ac
Dimensions:	200 mm (width) \times 149 mm (height) \times 323 mm (depth) 7 $\frac{7}{8}$ " (width) \times 5 $\frac{7}{8}$ " (height) \times 12 $\frac{3}{4}$ " (depth)
Net weight:	7.8 kg (17 lb 4 oz)
Shipping weight:	9.1 kg (20 lb 1 oz)

1-2. DETAILED CIRCUIT ANALYSIS

The following describes the function or operation of all stages and controls. The text sequence follows signal paths. Stages are listed by transistor reference designation at the left margin; major components are also listed in a similar manner. Refer to the block diagram on page 16 and the schematic diagram on page 17.

Stage/Control	Function
Power Amplifier Section	
LEVEL control R101 (R201)	Adjusts the input signal to the level required for the following power amplifier to obtain a desired output.
Preamplifier Q101, Q102	Q101 and Q102 form a para-phase amplifier but signal output is extracted from the collector circuit of Q101. This circuit has various advantages in direct coupling systems. One is high stability despite temperature variations and another is high input impedance without reducing the amplifier's gain. The ac output appears across load resistor R104 (2.7 k) in the collector circuit. An emitter decoupling circuit is formed by the emitter-base resistance of Q102, C103 and R109 in the base circuit of Q102. An emitter circuit formed by the emitter-base resistance of Q102, C103, and R109 is essentially a frequency-selective ac bypass to reduce the amplifier's gain at very low frequencies. Common emitter-resistor R106 keeps the dc current flow constant in Q101 and Q102, thus increasing the dc stability.
Dc balance adj. R140, (R240)	The stabilized positive and negative power supply voltage, generated at D314 and D315, are picked off by R140 and R240, and applied to the base of Q101 (Q201) to set the output terminal voltage at zero dc.

Stage/Control	Function
Thermal compensation and noise suppressor D101	As all the stages are directly coupled, dc stability is required. The negative temperature coefficient of D101 provides thermal compensation for the following driver stage. It also acts as a noise suppressor to reduce the popping noise due to unbalanced current flow in the following stages when the power switch is turned off.
Driver Q103	Though this stage is a conventional flat amplifier, it determines the output voltage swings because the following stages are basically emitter-followers. The ac load resistor for this stage is R114.
Dc bias adj. (idling current) Q104, R111	Q104 is biased into conduction and operates as a small resistance providing the necessary forward bias on the two cascaded emitter-followers. R111 controls the base bias of Q104, determining its emitter-collector impedance and thereby controls the dc bias voltage for the following complementary circuit.
Thermal compensator for dc bias D102, (D202)	The negative temperature coefficient of diodes D102 and (D202) provides thermal compensation for the complementary and power transistor circuits. D102 is attached to the power transistor's heat sink to detect temperature increases in the power transistors.
Complementary circuit Q108, Q109	These transistors operate as emitter-followers to provide the current swings demanded of the output stages and also provide the necessary phase inversion. Phase inversion is performed by using PNP and NPN type transistors.
Power transistor Q110, Q111	The output transistors Q110 and Q111 are connected directly to a power supply of about $\pm 50V$.

Stage/Control	Function
Protection circuit	Q110 supplies power to the load during the positive half cycle and Q111 operates during the negative half cycle. As all the stages are directly coupled and designed to obtain zero potential at the output terminal, the large coupling capacitor at the output which may cause power loss or distortion at low frequencies is eliminated. Two kinds of protection circuits are employed in this power amplifier. One is a power transistor protection circuit and the other is a speaker system protection circuit.
Power transistor protection circuit	To protect overloaded power transistors from destruction, a new protection circuit is employed. In the event of a short circuit at the output terminals, the protection circuit holds down the current in the power transistor so as not to make it overheat and also limit the input drive signals. Fig. 1-1 shows a partial schematic diagram detailing the

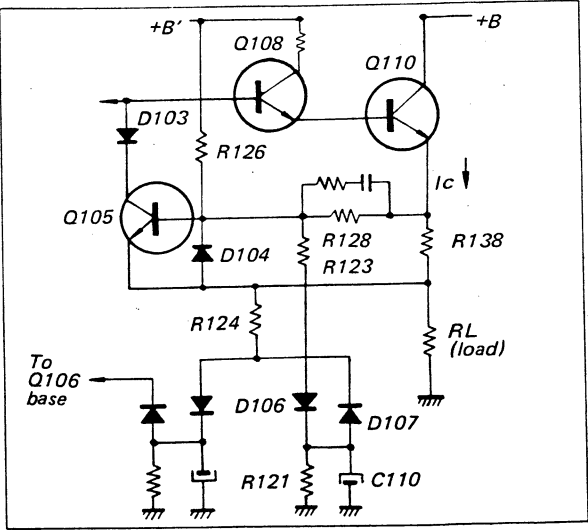


Fig. 1-1 Simplified protection circuit

Stage/Control

Function

protection circuit. With reference to this diagram, the protection circuit operates as follows:

(Since the protection circuit is identical for positive-going half cycles and negative-going half cycles, only the positive-going half cycle operation is described here)

Q105 limits the positive-going half cycle of the drive voltage applied to the base of Q108 when power consumption at the Q110 collector exceeds the safety margin.

Since power dissipation at the collector can be considered a function of collector voltage (B+ voltage) and current which flows in the power transistor, the trigger signal for Q105 is taken from the B+ line and emitter of Q110.

Base voltage is partly determined by the ratio of resistance of R126 and series resistance of R128, R138 and RL (load).

Base voltage is also determined by the current flow in the R138 and the collector voltage of Q108.

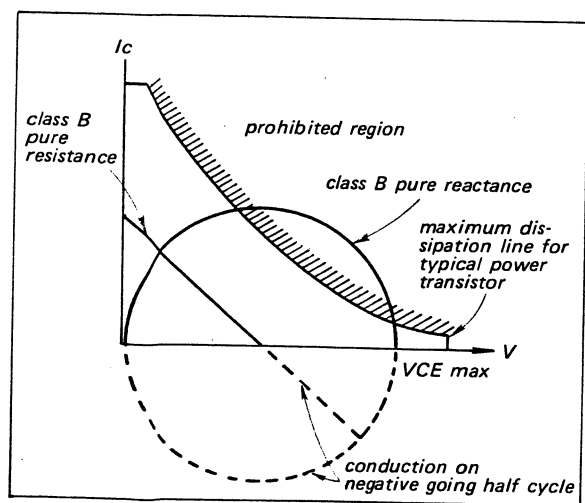


Fig. 1-2 Resistance and reactive load lines for class B output stage showing breakdown risk in purely resistive load

Stage/Control

Function

During normal operation, Q105 is cutoff. When excessive current flows in the power transistor or power dissipation at the collector of the power transistor exceeds the specified value, Q105 turns on and limits the input drive voltage to the power transistor.

Limiting operation is also actuated by the condition of the load.

The base voltage of Q105 is determined by the resistances R123, R121, R128, R138 and RL (load).

D106 prevents reverse voltage from being applied during the negative-going half cycle. Q105 turns on limiting the input drive voltage to the power transistor when the load resistance decreases to some extent.

Under reactive load conditions in class B amplifiers, maximum current will flow when the voltage across the power transistor is maximum and this is the worst case for secondary breakdown. See Fig. 1-2.

Since all speakers have reactive properties, the protection circuit must take care of this problem.

Fig. 1-2 shows the operating load lines for one half of a class B output stage under conditions of equal load impedance; in one case the load is purely reactive load case would result in transistor failure.

Through a complex network of resistors and transistors, D107, C110 and R124 change the base voltage of Q105 according to the reactive voltage induced in the load to provide proper protection.

Diode D107 detects reactive voltage at the output terminal and charges C110. This voltage changes the bias on Q105 to compensate for the reactive voltage.

Stage/Control

Function

Speaker protection circuit

D104 protects Q105 from breakdown between base and emitter due to detected reactive voltage across C110.

In a direct-coupled power amplifier, some faults in the prior transistor appears as a large unbalanced dc voltage across output terminal. This might damage a delicate speaker system. Therefore, the TA-3130F incorporates speaker protection circuit which operates as follows (refer to Fig. 1-3):

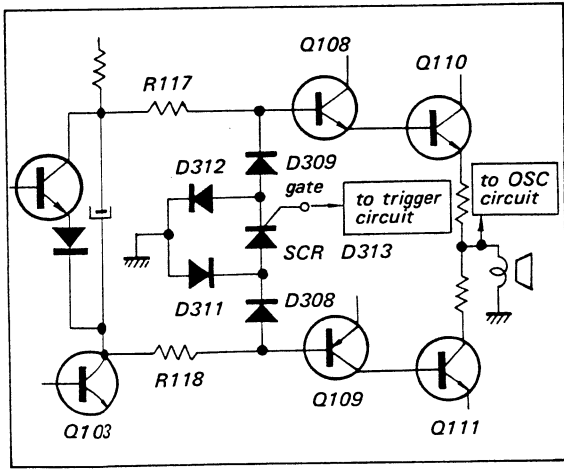


Fig. 1-3 Speaker protection circuit

The output signal is extracted from the output terminal through a low-pass filter (R141 or R241, C315 and C316) and fed to the bridge rectifier (D304 ~ D307). Because of this filter, the voltage applied to the bridge rectifier is only the very-low frequency or dc component caused by transistor faults. When the rectified dc voltage becomes large enough, it starts the Hartley oscillator (Q303 and Tosc).

Stage/Control

Function

The oscillator's output is rectified by D310 and thus provides trigger voltage for SCR D313. When the trigger voltage is applied to the gate of SCR, the SCR turns on and shorts the base voltage of Q108 to ground through D308, the SCR, and D312. The base voltage of Q109 is also shorted to ground through D311, the SCR, and D309, stopping any current flow in the output stage and thus protecting the speaker system.

Note that the direction of diodes D308, SCR D313 and D309 which also ensure the speaker protection operation even if one of the power transistors is damaged by accident, forcing the other power transistor into secondary breakdown.

Power Supply Section

Rectifier D301

A full-wave bridge rectifier and center-tapped transformer provides positive and negative dc power supplies for the power amplifier.

Rectifier D302, D303

A pair of half-wave rectifiers (D302 and D303) and filter capacitors (C303 and C304) supply additional dc power upon bridge-rectifier output for complementary stages.

Ripple filter Q301, Q302

These components reduce the ripple voltages in the dc power supply for preamplifier and driver stages of the power amplifier section to an extremely-low value.

Q301 and Q302 serve as an electronic filter to supply well filtered dc of about $\pm 52V$ to preamplifier stages in the power amplifier.

SECTION 2

DISASSEMBLY AND REPLACEMENT PROCEDURE

WARNING

Unplug the ac power cord before starting any disassembly or replacement procedures.

2-1. TOOLS REQUIRED

The following tools are required to perform disassembly and replacement procedures on the TA-3130F.

1. Screwdriver, Phillips-head
2. Screwdriver, 3 mm (1/8") blade
3. Pliers, long-nose
4. Diagonal cutters
5. Wrench, adjustable
6. Tweezers
7. Electric drill
8. Drill bits
9. Prick punch
10. Hammer, ball-peen
11. Soldering iron, 40 to 50 watts
12. Solder, rosin core
13. Cement solvent
14. Cement, contact
15. Silicone grease

2-2. HARDWARE IDENTIFICATION GUIDE

The following chart will help you to decipher the hardware codes given in this service manual.

Note: All screws in this set are manufactured to the specifications of the International Organization for Standardization (ISO). This means that the new and old screws are not interchangeable because ISO screws have a different number of threads per mm compared to the old ones. The ISO screws have an identification mark on their heads as shown in Fig. 2-1.

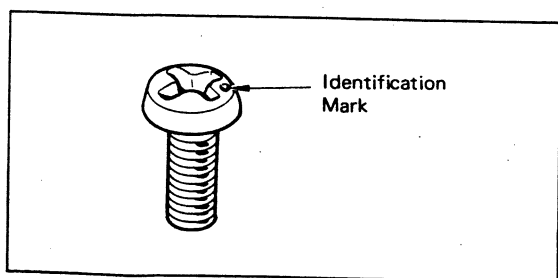
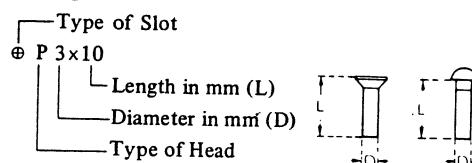


Fig. 2-1 ISO screw

— Hardware Nomenclature —

P	— Pan Head Screw		
PS	— Pan Head Screw with Spring Washer		
K	— Flat Countersunk Head Screw ...		
B	— Binding Head Screw		
RK	— Oval Countersunk Head Screw ..		
T	— Truss Head Screw		
R	— Round Head Screw		
F	— Flat Fillister Head Screw		
SC	— Set Screw		
E	— Retaining Ring (E Washer)		
	W — Washer		
	SW — Spring Washer		
	LW — Lock Washer		
	N — Nut		

— Example —



2-3. TOP COVER AND FRONT PANEL REMOVAL

1. Remove the two machine screws at each side of the case, and lift off the top cover.
2. Remove the POWER switch knob by pulling it straight out.
3. Remove the two screws (⊕PSW 4x6) behind the top edge of the front subchassis as shown in Fig. 2-2.
4. Remove the two self-tapping screws (⊕B 3x6) at the front bottom of the chassis as shown in Fig. 2-3. This frees the front panel.

2-4. PILOT LAMP REPLACEMENT

1. Remove the top cover as described in Procedure 2-3.
2. Straighten the tab of the pilot lamp holder to permit the removal of the pilot lamp socket, then pull out the pilot lamp socket. See Fig. 2-4.
3. Unscrew the lamp from the socket and install a new one. Care should be taken not to lose the black lamp shade.



Fig. 2-2 Front panel removal

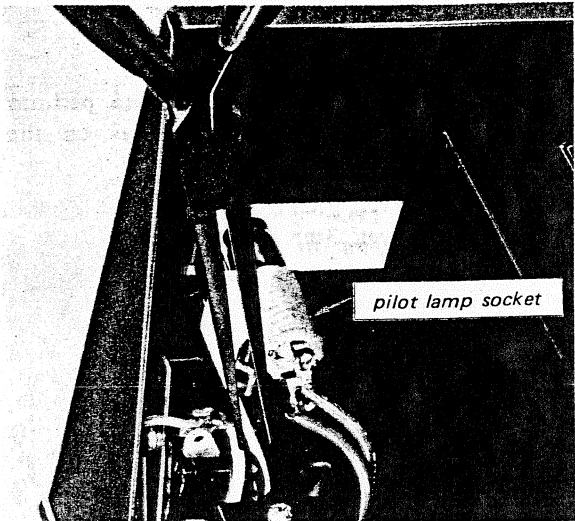


Fig. 2-4 Pilot lamp replacement

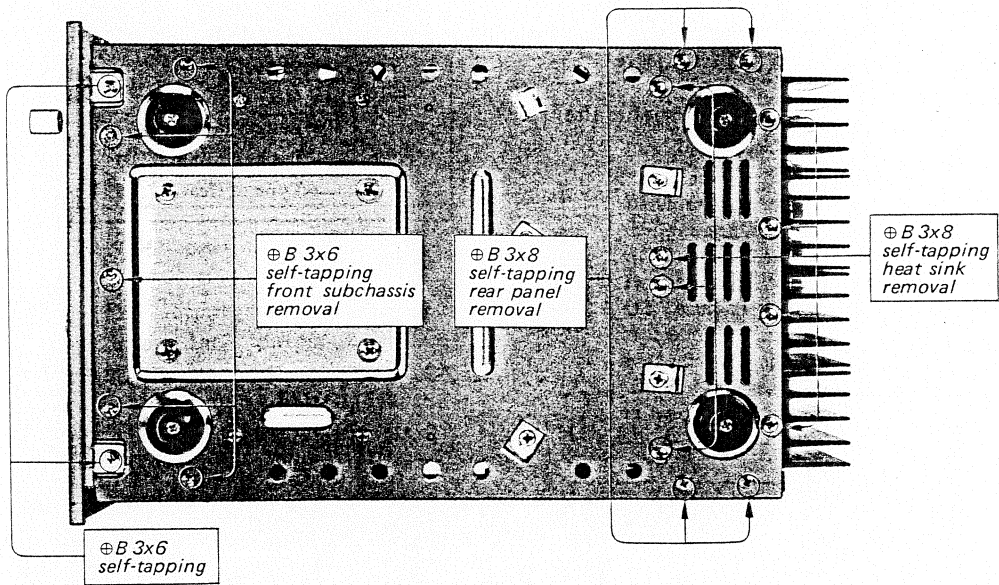


Fig. 2-3 Bottom view

2-5. FRONT SUBCHASSIS REMOVAL

The front subchassis is the vertical member on which the switch and controls are attached.

1. Remove the top cover and front panel as described in Procedure 2-3.
2. Remove the five self-tapping screws ($\oplus B 3 \times 6$) at front bottom of the chassis as shown in Fig. 2-3. This frees front subchassis as shown in Fig. 2-5.

2-6. CONTROL AND SWITCH REPLACEMENT

Prepare for replacing any of the controls or switch by removing the front subchassis as described in Procedure 2-5.

POWER switch

1. Remove the two screws ($\oplus PS 3 \times 6$) securing the defective switch to the front subchassis as shown in Fig. 2-6.
2. Unsolder the lead wires from the defective switch, and then install the replacement switch.

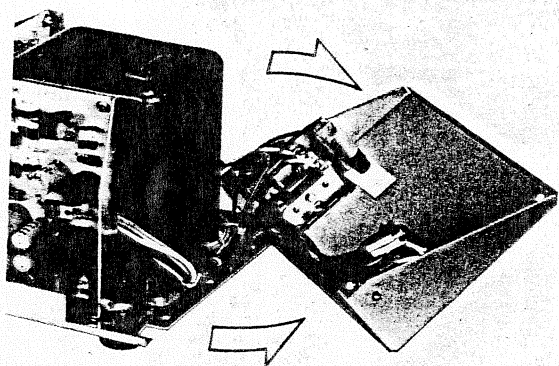


Fig. 2-5 Front subchassis removal

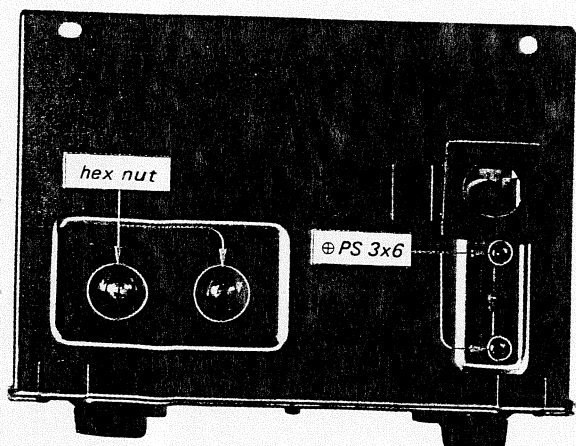


Fig. 2-6 Control and switch replacement

LEVEL controls

1. Remove the hex nuts that secure the controls to the front subchassis as shown in Fig. 2-6.
2. Unsolder the lead wires from the defective control, and then install the new one.

2-7. POWER TRANSISTOR REPLACEMENT

1. Remove the top cover as described in Procedure 2-3.
2. Remove the four self-tapping screws ($\oplus B 3 \times 8$) securing top heat sink bracket and one self-tapping screw ($\oplus B 3 \times 8$) securing a terminal strip to the heat sink as shown in Fig. 2-7.
3. Remove the four self-tapping screws ($\oplus B 3 \times 8$) securing a pair of heat sink to the chassis as shown in Fig. 2-3.
4. Carefully draw back the heat sink, and then remove the two screws ($\oplus T 3 \times 14$) securing the power transistor and power transistor socket to the heat sink. See Fig. 2-8.
5. When replacing the power transistor, apply a coating of a heat-transferring grease to both sides of the insulating mica washer. Any excess grease squeezed out when the mounting bolts are tightened should be wiped off with a clean cloth. This prevents it from accumulating conductive dust particles that might eventually cause a short.

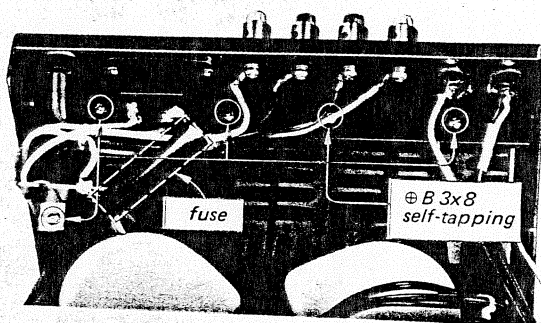


Fig. 2-7 Heat sink removal

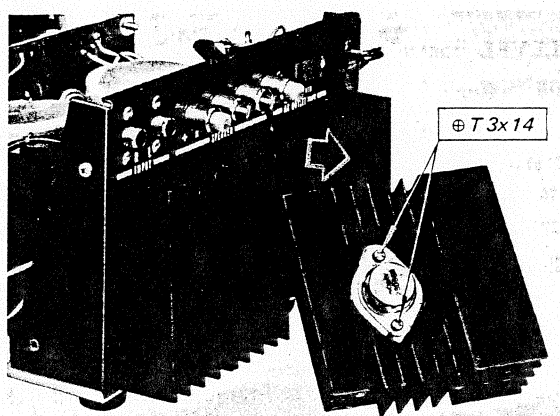


Fig. 2-8 Power transistor replacement

2-8. REAR PANEL REMOVAL

1. Remove the top cover as described in Procedure 2-3.
2. Remove the four self-tapping screws (⊕ B 3x8) securing heat sink bracket and one self-tapping screw (⊕ B 3x8) securing a terminal strip to the heat sink as shown in Fig. 2-7.
3. Remove the four self-tapping screws (⊕ B 3x8) at the rear bottom of the chassis as shown in Fig. 2-3. This frees rear panel.

2-9. REPLACEMENT OF COMPONENTS SECURED TO THE REAR PANEL BY RIVETS

1. Remove the rear panel as described in Procedure 2-8.

2. Bore out the rivets using a drill bit slightly larger in diameter than the rivet. See Fig. 2-9.
3. Punch out the remainder of the rivet with a nail set or prick punch.
4. Remove the defective component, and then install a new one.
5. Secure the new component with a suitable screw and nut, or a repair rivet screw (part number 3-701-402).

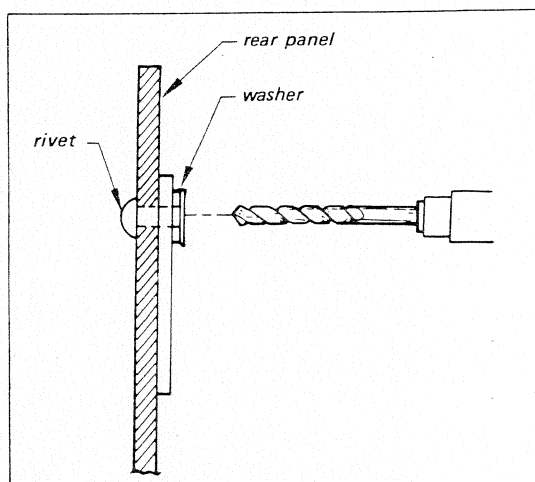
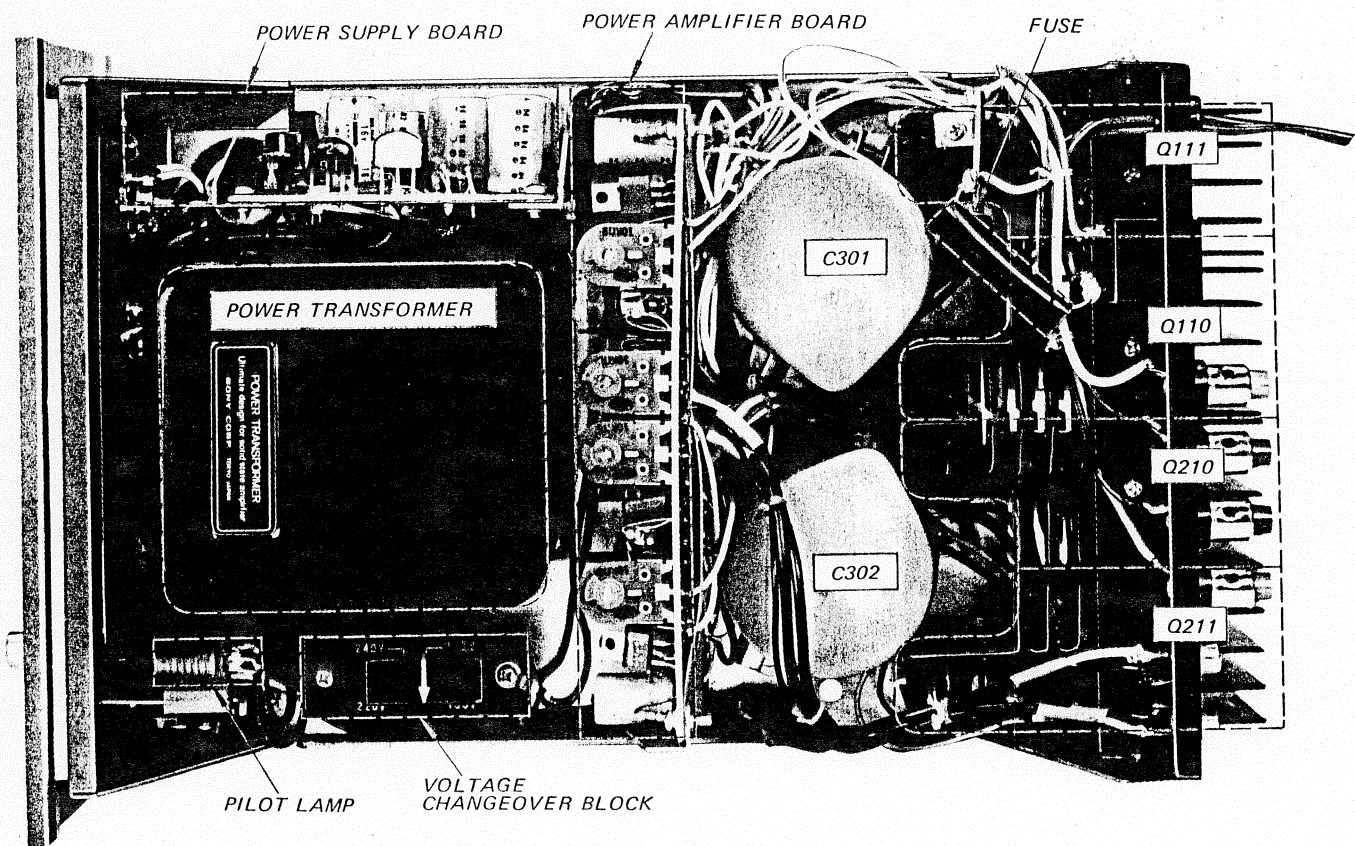


Fig. 2-9 Rivet replacement

2-10. CHASSIS LAYOUT



SECTION 3
POWER AMPLIFIER ADJUSTMENT

Note: There are two adjustment items in the power amplifier. One is dc-bias adjustment and the other is dc-balance adjustment. These adjustments should be alternately repeated two or three times after replacing any of the power transistors until the best operation is obtained.

3-1. DC-BIAS ADJUSTMENT

Serious deficiencies in performance, such as thermal runaway of power transistors, will result if this adjustment is improperly set.

CAUTION

To avoid accidental power transistor damage, increase the ac line voltage gradually, using a variable transformer, while measuring the voltage across emitter resistors (R138 or R238) of power transistors alternately as shown in Fig. 3-1 or Fig. 3-2. Check to see that the reading does not exceed 25 mV. If it does, turn off the power as soon as possible, then check and repair the trouble in the power amplifier board.

Test Equipment Required

- 1. Dc millivoltmeter:
Capable of measuring dc voltage of 100 mV or less.
- 2. Variable transformer
- 3. Screwdriver with 3 mm (1/8") blade

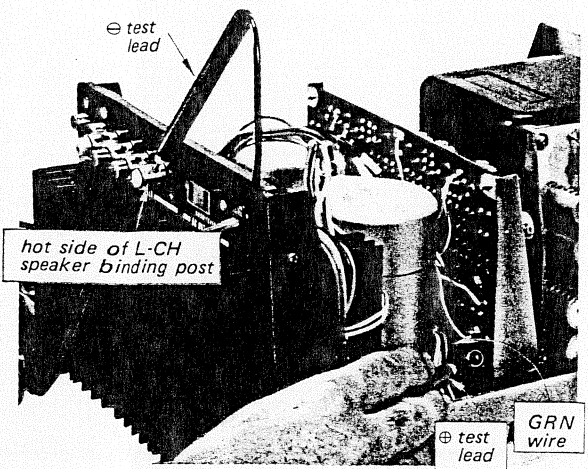


Fig. 3-1 DC millivoltmeter connection point (L-CH check)

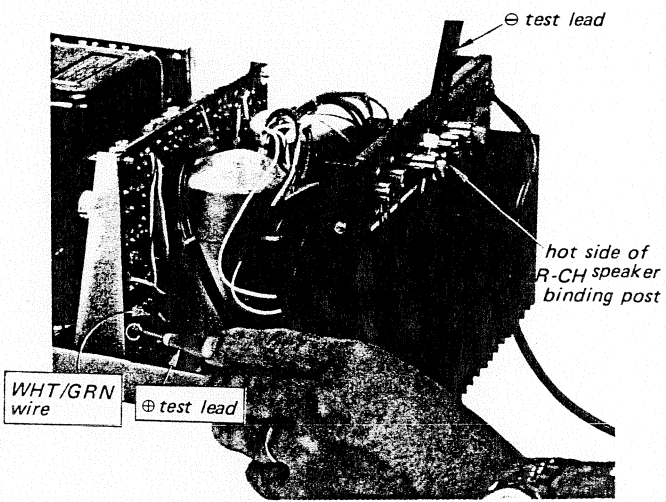


Fig. 3-2 DC millivoltmeter connection point (R-CH check)

Preparation

- 1. Remove the top cover as described in Procedure 2-3.
- 2. Connect the dc millivoltmeter to emitter resistor R138 of power transistor Q110 and the hot side of the speaker binding post L-CH as shown in Fig. 3-1.

Procedure

- 1. Apply a drop of cement solvent to the semi-fixed resistors on the power amplifier board, and then set the semi-fixed resistors (see Fig. 3-3) on the power amplifier board as follows:
R111 (L-CH, dc-bias) fully clockwise
R211 (R-CH, dc-bias) fully counter-clockwise
R140, R240
(dc-balance) mid position
- 2. Set the variable transformer for minimum output.
- 3. Turn the POWER switch to ON, and then increase the line voltage up to the rated value.
- 4. Adjust R111 (R211) to obtain a 25 mV reading on the meter, and then follow the dc-balance adjustment.

3-2. DC-BALANCE ADJUSTMENT

Excessive harmonic distortion at high levels or speaker system damage will result if this adjustment is improperly set.

Test Equipment Required

1. Dc null meter or dc millivoltmeter
2. Screwdriver with 3 mm ($\frac{1}{8}$ ") blade

Preparation

1. Connect the dc null meter or dc millivoltmeter to the MAIN speaker output terminal.

Procedure

1. Turn the POWER switch to ON, and then adjust R140 (R240) to obtain a 0V reading on the meter.
2. After 10 minutes warm-up, alternately repeat this and the dc bias adjustment two or three times.
3. After completing the adjustment, apply a drop of lock paint to R111 and R140 (R211 and R240).

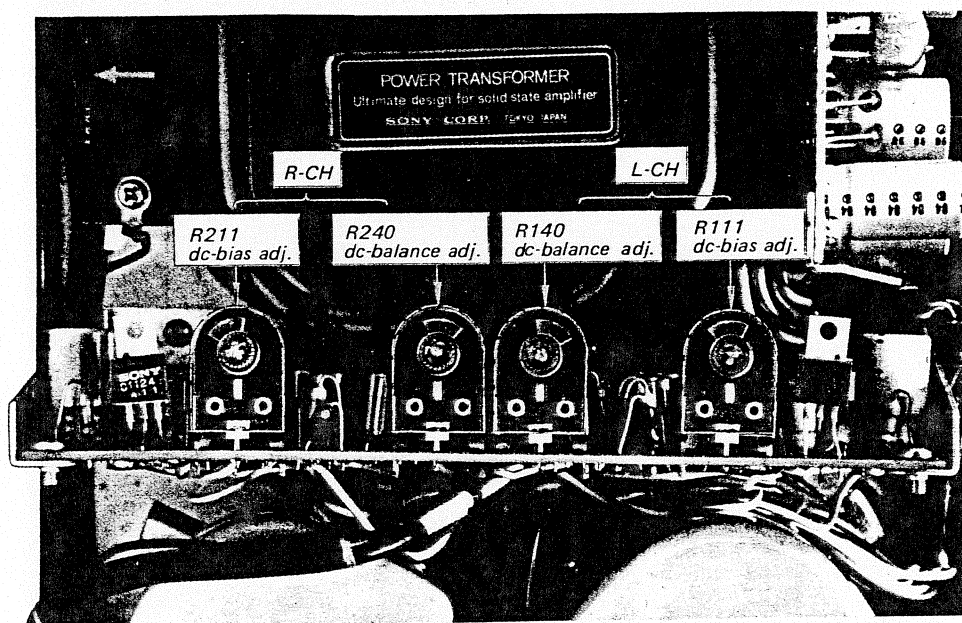
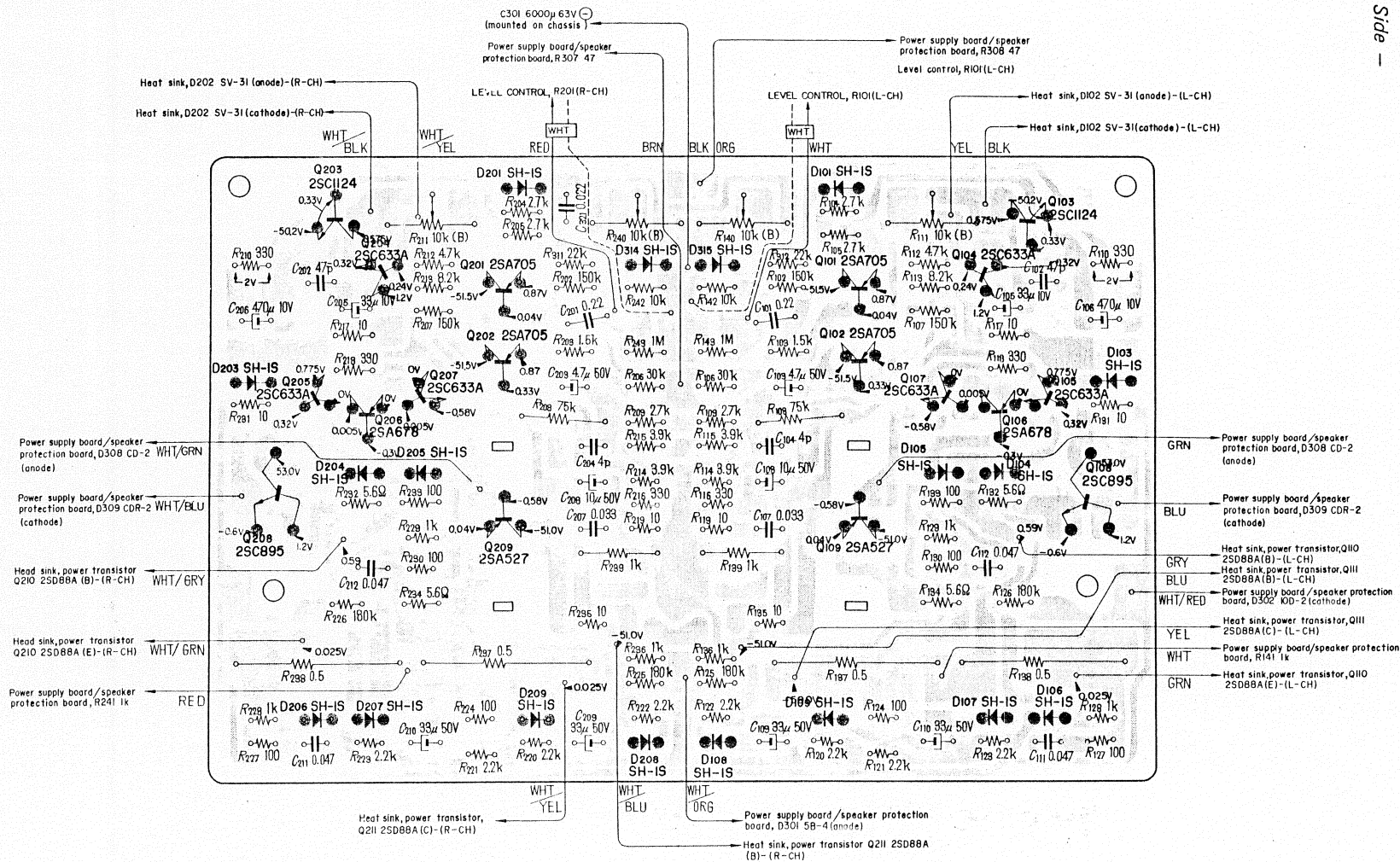
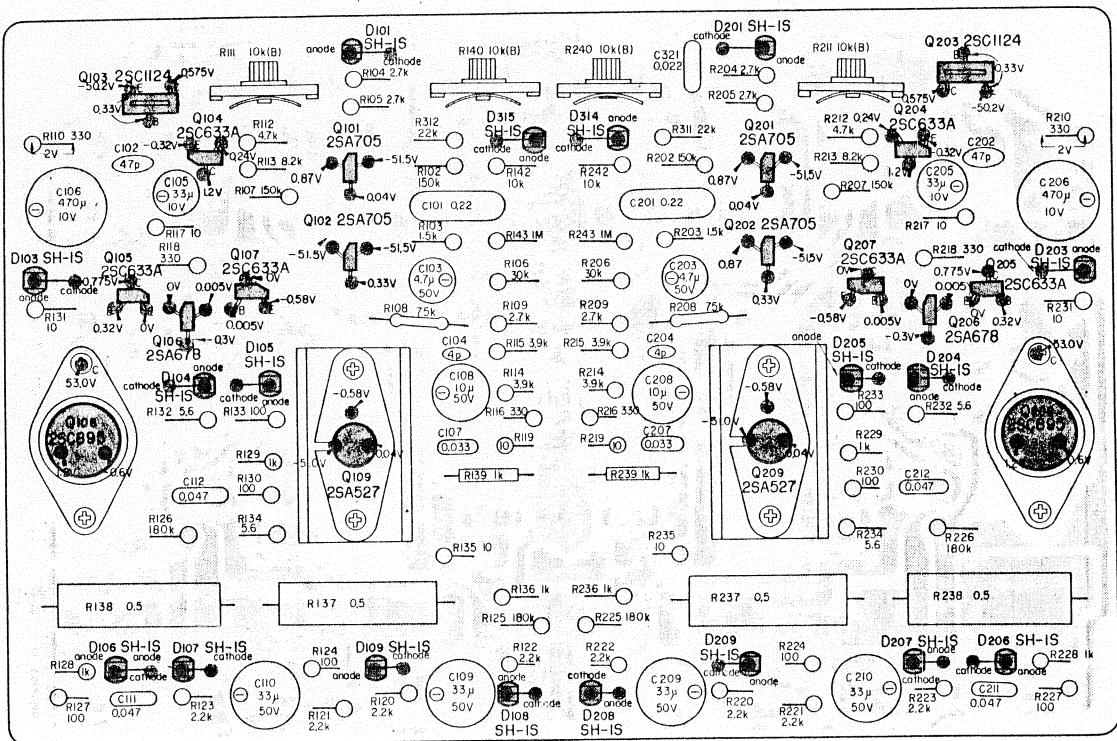


Fig. 3-3 Parts location

— 12 —

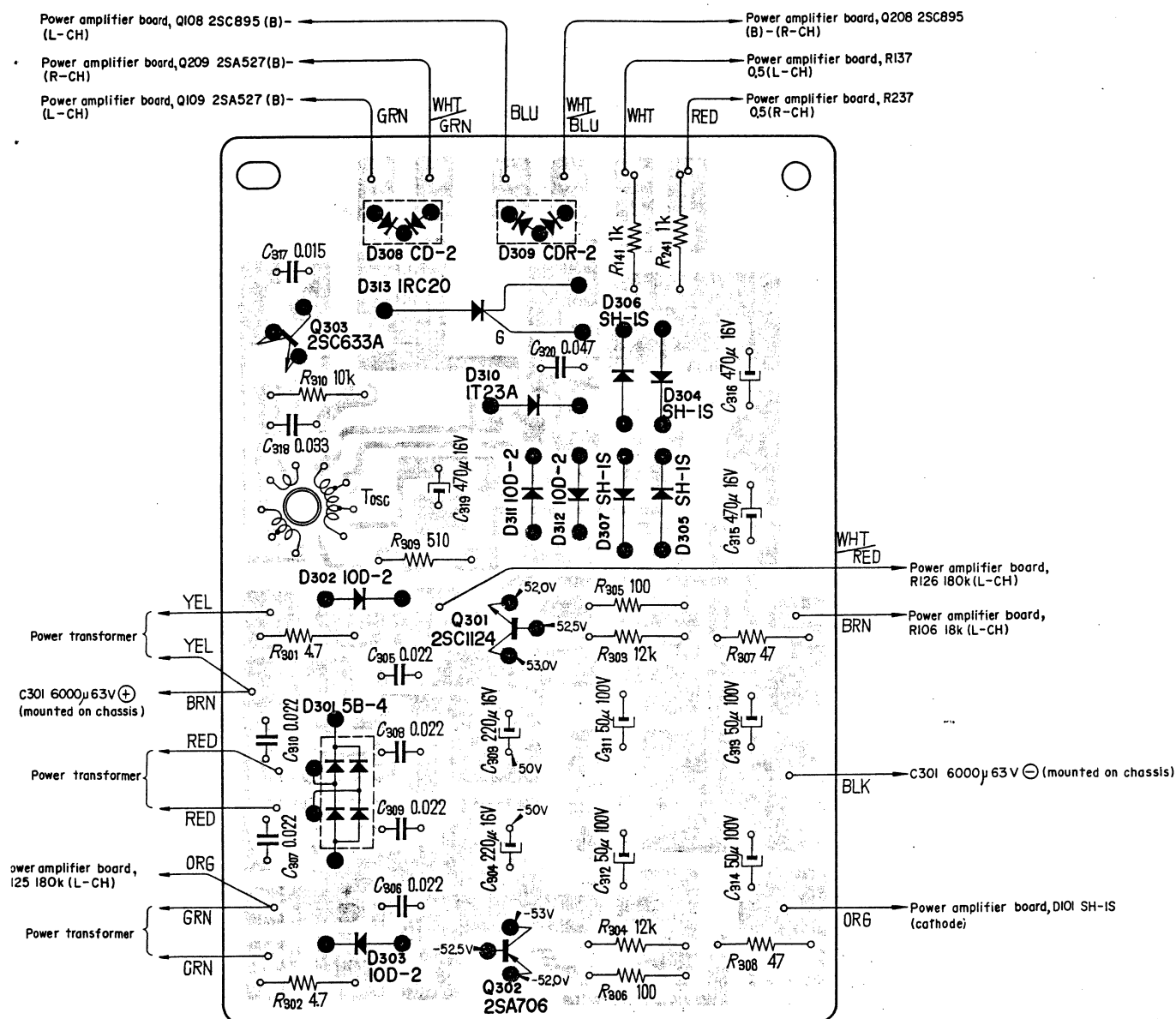


4-1. MOUNTING DIAGRAM — Power Amplifier Board —
— Component Side —



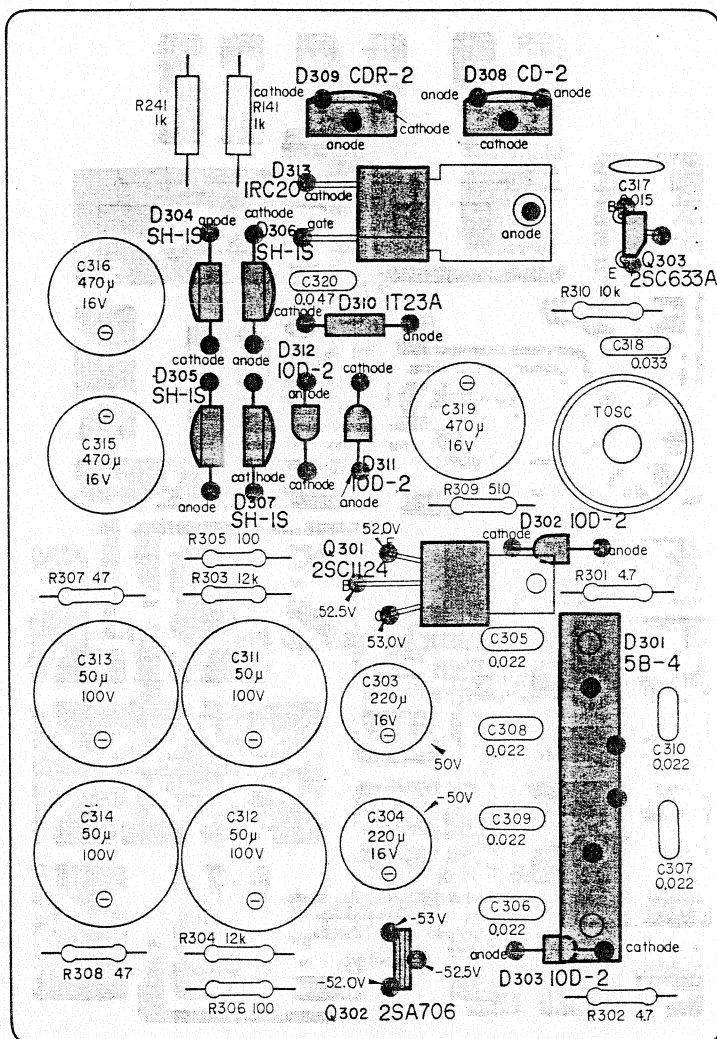
4-2. MOUNTING DIAGRAM — Power Supply/Speaker Protection Board —

— Conductor Side —

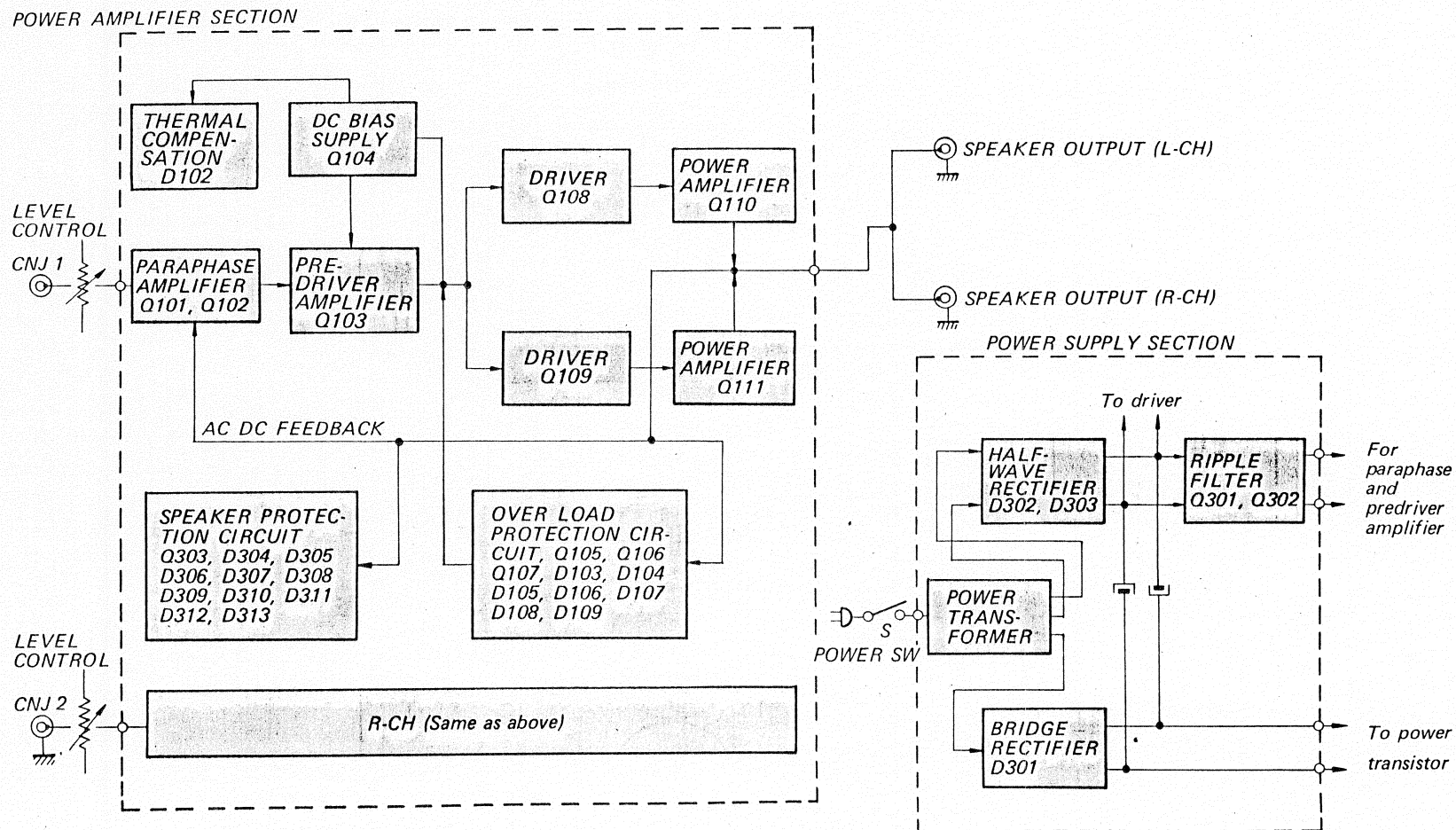


4-2. MOUNTING DIAGRAM — Power Supply/Speaker Protection Board —

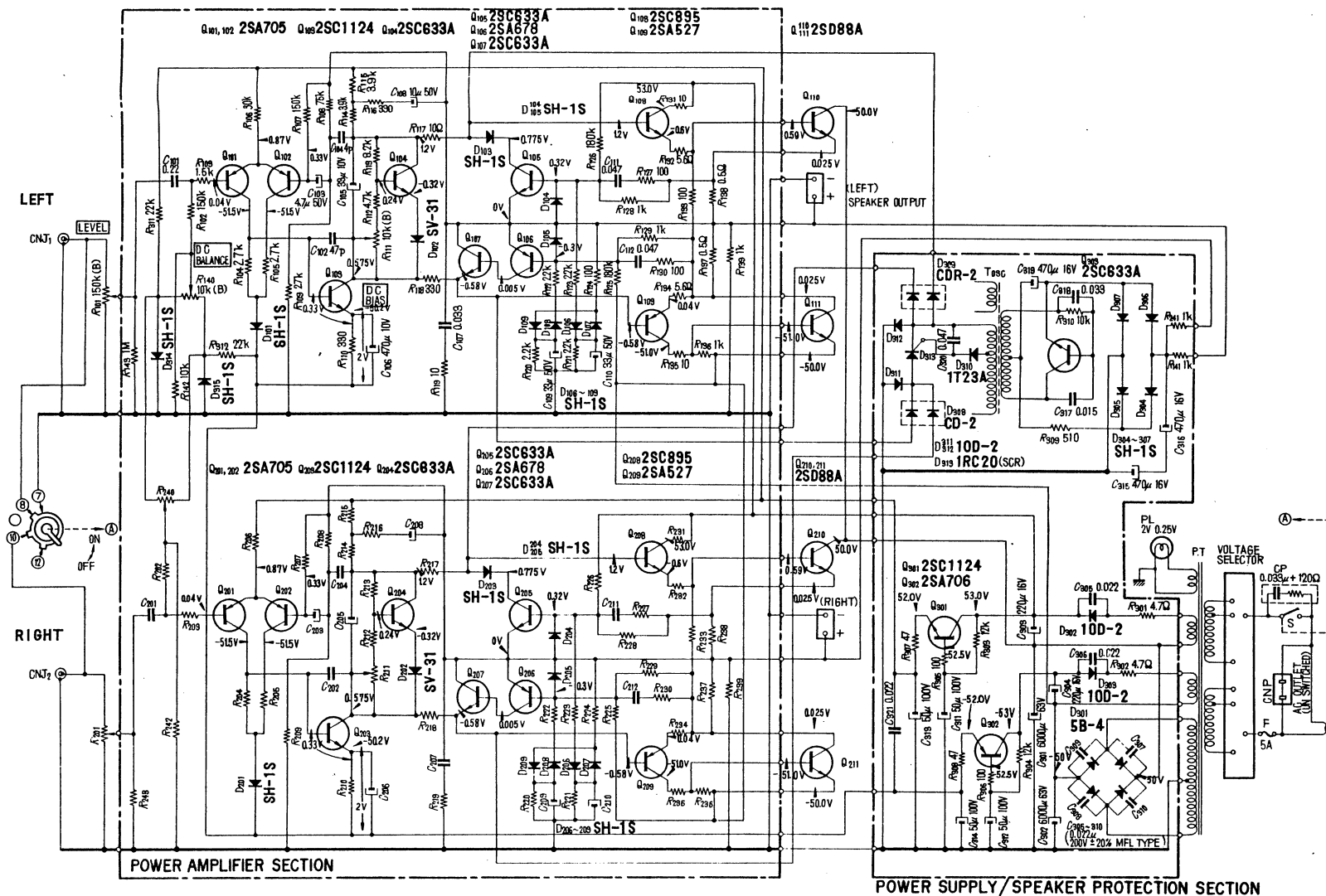
— Component Side —



4.3. BLOCK DIAGRAM



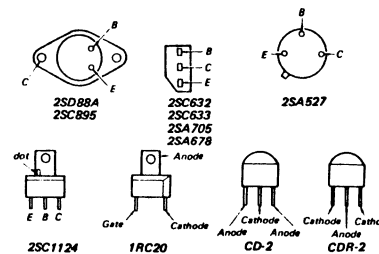
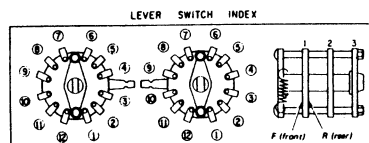
4. SCHEMATIC DIAGRAM



Ref. No.	Description	Position
S	POWER SW (OFF-ON)	OFF

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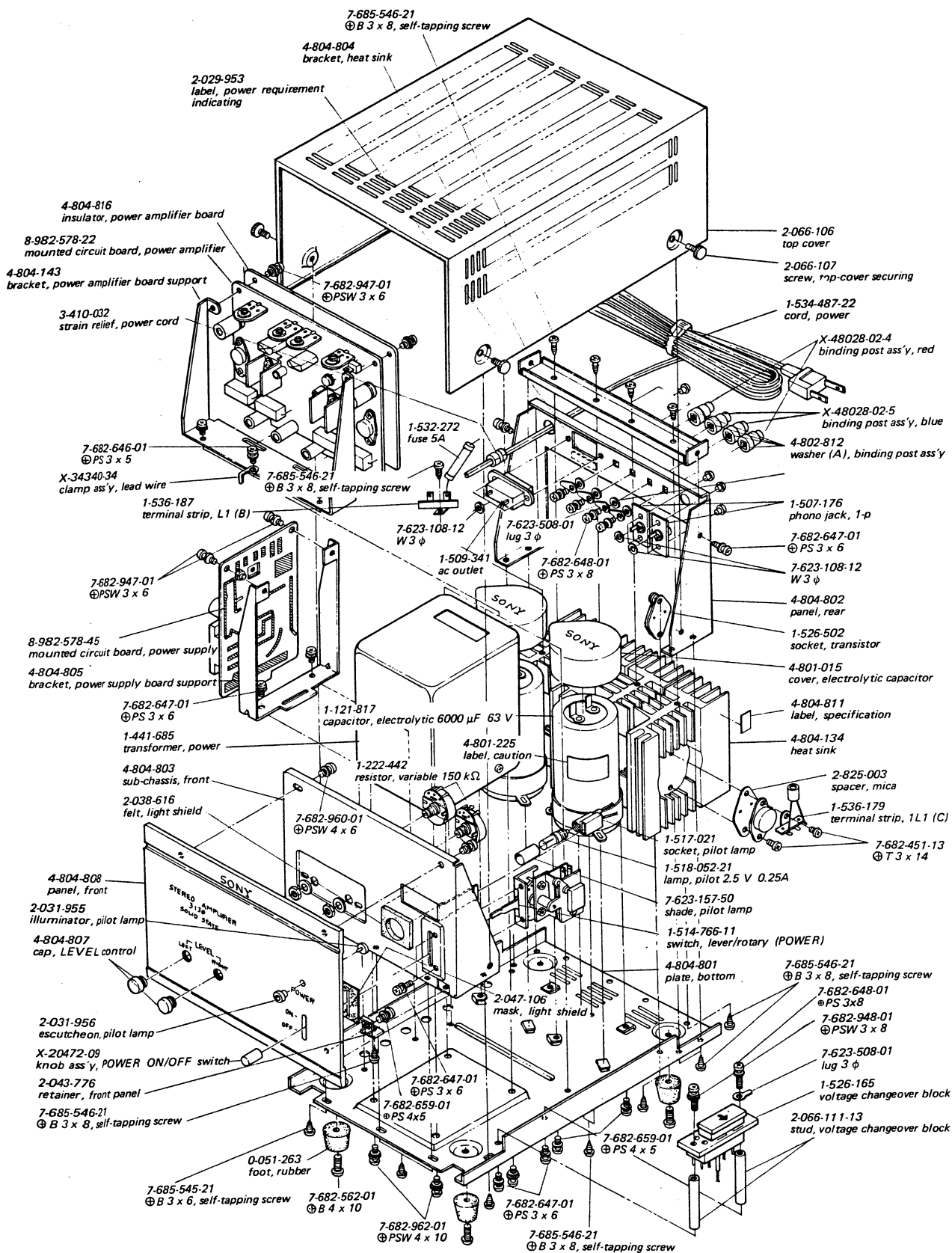


Note:

All resistance values are in ohms. k=1,000, M=1,000k
All capacitance values are in μ F except as indicated with p, which means μ F
All voltages represent an average value and should hold within $\pm 20\%$.
All voltages are dc measured with a VOM which has an input impedance of 20k ohms/volt. No signal in.

TA-3130F

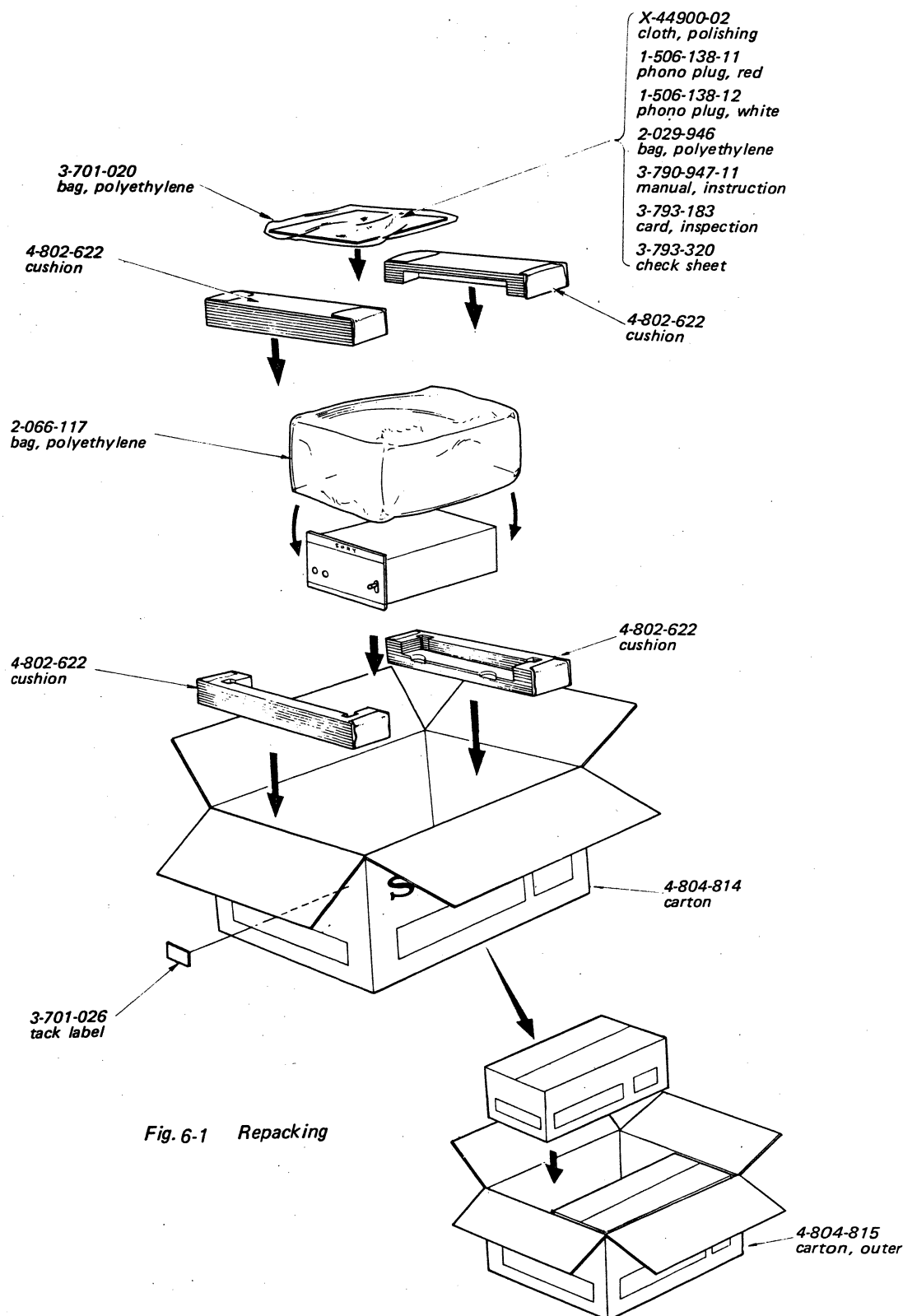
SECTION 5 EXPLODED VIEW



SECTION 6 REPACKING

The TA-3130F's original shipping carton and packing materials are the ideal container for shipping the unit. However to secure the maximum

protection, the TA-3130F must be repacked in these materials precisely as before. The proper repacking procedures are shown in Fig. 6-1.



SECTION 7

ELECTRICAL PARTS LIST

Ref. No. Part No. Description

MOUNTED CIRCUIT BOARDS

8-982-578-22 Power Amplifier Circuit Board
8-982-578-45 Power Supply/Speaker Protection
Circuit Board

SEMICONDUCTORS

D101(D201)	diode	SH1S
D102(D202)	varistor	SV-31
D103(D203)	diode	SH1S
D104(D204)	diode	SH1S
D105(D205)	diode	SH1S
D106(D206)	diode	SH1S
D107(D207)	diode	SH1S
D108(D208)	diode	SH1S
D109(D209)	diode	SH1S

D301	diode	5B4
D302	diode	10D2
D303	diode	10D2
D304	diode	SH1S
D305	diode	SH1S
D306	diode	SH1S
D307	diode	SH1S
D308	diode	CD2
D309	diode	CDR2
D310	diode	1T23A
D311	diode	10D2
D312	diode	10D2
D313	SCR	1RC20
D314	diode	SH1S
D315	diode	SH1S

Q101(Q201)	transistor	2SA705
Q102(Q202)	transistor	2SA705
Q103(Q203)	transistor	2SC1124
Q104(Q204)	transistor	2SC633A
Q105(Q205)	transistor	2SC633A
Q106(Q206)	transistor	2SA678
Q107(Q207)	transistor	2SC633A
Q108(Q208)	transistor	2SC895
Q109(Q209)	transistor	2SA527
Q110(Q210)	transistor	2SD88A
Q111(Q211)	transistor	2SD88A

TRANSFORMERS

Tosc	1-433-132	transformer, osc
PT	1-441-685	transformer, power

Ref. No. Part No. Description

CAPACITORS

All capacitance values are in μF except as indicated with p, which means μF .

C101(C201)	1-105-689-12	0.22	$\pm 10\%$	50V, mylar
C102(C202)	1-107-077	47p	$\pm 5\%$	50V, silvered mica
C103(C203)	1-121-396	4.7	$\pm 10\%$	50V, electrolytic
C104(C204)	1-107-101	4p	$\pm 0.5\text{pF}$	50V, silvered mica
C105(C205)	1-121-402	33	$\pm 10\%$	10V, electrolytic
C106(C206)	1-121-425	470	$\pm 10\%$	10V, electrolytic
C107(C207)	1-105-679-12	0.033	$\pm 10\%$	50V, mylar
C108(C208)	1-121-738	10	$\pm 10\%$	50V, electrolytic
C109(C209)	1-121-405	33	$\pm 10\%$	50V, electrolytic
C110(C210)	1-121-405	33	$\pm 10\%$	50V, electrolytic
C111(C211)	1-105-681-12	0.047	$\pm 10\%$	50V, mylar
C112(C212)	1-105-681-12	0.047	$\pm 10\%$	50V, mylar

C301	1-121-817	6,000	$\pm 10\%$	63V, electrolytic
C302	1-121-817	6,000	$\pm 10\%$	63V, electrolytic
C303	1-121-421	220	$\pm 10\%$	16V, electrolytic
C304	1-121-421	220	$\pm 10\%$	16V, electrolytic
C305	1-105-917-12	0.022	$\pm 20\%$	200V, mylar
C306	1-105-917-12	0.022	$\pm 20\%$	200V, mylar
C307	1-105-917-12	0.022	$\pm 20\%$	200V, mylar
C308	1-105-917-12	0.022	$\pm 20\%$	200V, mylar
C309	1-105-917-12	0.022	$\pm 20\%$	200V, mylar
C310	1-105-917-12	0.022	$\pm 20\%$	200V, mylar
C311	1-121-559	50	$\pm 10\%$	100V, electrolytic
C312	1-121-559	50	$\pm 10\%$	100V, electrolytic
C313	1-121-559	50	$\pm 10\%$	100V, electrolytic
C314	1-121-559	50	$\pm 10\%$	100V, electrolytic
C315	1-121-426	470	$\pm 10\%$	16V, electrolytic
C316	1-121-426	470	$\pm 10\%$	16V, electrolytic
C317	1-105-675-12	0.015	$\pm 10\%$	50V, mylar
C318	1-105-679-12	0.033	$\pm 10\%$	50V, mylar
C319	1-121-426	470	$\pm 10\%$	16V, electrolytic
C320	1-105-681-12	0.047	$\pm 10\%$	50V, mylar
C321	1-105-917-12	0.022	$\pm 20\%$	200V, mylar

RESISTORS

All resistance values are in ohms, $\pm 5\%$, $\frac{1}{4}$ watts and carbon type unless otherwise indicated.

R101(R201)	1-222-442	150k (B), variable
R102(R202)	1-242-725	150k
R103(R203)	1-242-677	1.5k
R104(R204)	1-242-683	2.7k
R105(R205)	1-242-683	2.7k
R106(R206)	1-242-708	30k
R107(R207)	1-242-725	150k
R108(R208)	1-244-718	75k
R109(R209)	1-242-683	2.7k
R110(R210)	1-242-661	330

<u>Ref. No.</u>	<u>Part No.</u>	<u>Description</u>
R111(R211)	1-221-967	10k (B), semi-fixed
R112(R212)	1-242-689	4.7k
R113(R213)	1-242-695	8.2k
R114(R214)	1-202-587	3.9k $\pm 10\%$ $\frac{1}{2}W$, composition
R115(R215)	1-202-587	3.9k $\pm 10\%$ $\frac{1}{2}W$, composition
R116(R216)	1-242-661	330
R117(R217)	1-242-625	10
R118(R218)	1-242-661	330
R119(R219)	1-202-525	10 $\pm 10\%$ $\frac{1}{2}W$, composition
R120(R220)	1-242-681	2.2k
R121(R221)	1-242-681	2.2k
R122(R222)	1-242-681	2.2k
R123(R223)	1-242-681	2.2k
R124(R224)	1-202-549	100 $\pm 10\%$ $\frac{1}{2}W$, composition
R125(R225)	1-242-727	180k
R126(R226)	1-242-727	180k
R127(R227)	1-242-649	100
R128(R228)	1-242-673	1k
R129(R229)	1-242-673	1k
R130(R230)	1-242-649	100
R131(R231)	1-242-625	10
R132(R232)	1-242-619	5.6
R133(R233)	1-242-649	100
R134(R234)	1-242-619	5.6
R135(R235)	1-242-625	10
R136(R236)	1-242-673	1k
R137(R237)	1-205-803	0.5 $\pm 10\%$ 5W, wire-wound
R138(R238)	1-205-803	0.5 $\pm 10\%$ 5W, wire-wound
R139(R239)	1-242-673	1k
R140(R240)	1-221-967	10k (B), semi-fixed
R141(R241)	1-202-573	1k $\pm 10\%$ $\frac{1}{2}W$, composition
R142(R242)	1-242-697	10k
R143(R243)	1-242-745	1M

<u>Ref. No.</u>	<u>Part No.</u>	<u>Description</u>
R301	1-244-617	4.7
R302	1-244-617	4.7
R303	1-244-699	12k
R304	1-244-699	12k
R305	1-244-649	100
R306	1-244-649	100
R307	1-244-641	47
R308	1-244-641	47
R309	1-244-666	510
R310	1-244-697	10k
R311	1-242-705	22k
R312	1-242-705	22k

SWITCH

1-514-766-11 switch, lever/rotary (POWER)

MISCELLANEOUS

1-231-057-12 encapsulated component,
120 Ω + 0.033 μ F

1-507-176 phono jack, 1-P

1-509-341 ac outlet

1-517-021 socket, pilot lamp

1-518-052-21 lamp, pilot 2.5V 0.25 A

1-526-165 voltage changeover block

1-526-502 socket, transistor

1-532-272 fuse 5 A

1-534-487-22 cord, power

1-536-179 terminal strip, 1L1 (C)

1-536-187 terminal strip, L1 (B)